

Quantum Shot Noise

Carlo Beenakker

Instituut-Lorentz, Universiteit Leiden, Netherlands

"The noise is the signal" is a saying of Rolf Landauer, one of the founding fathers of mesoscopic physics. What he meant is that fluctuations in time of the electrical current may actually contain physical information that is not present in the time averaged signal. At zero temperature the current fluctuations arise from the discreteness of the electrical charge, and are therefore known as "shot noise". The first observation of shot noise goes back to Schottky's 1918 work on vacuum diodes, where it could be understood entirely in terms of classical mechanics.

In the last few years it has become possible to extract information from shot noise on the nanometer scale, where classical mechanics breaks down. This talk presents an overview of the recent developments, with an emphasis on the new physical concepts introduced to understand quantum shot noise.